

UNIVERSITI TEKNOLOGI MARA

**STUDY IN THE ACTIVITY OF
COMMERCIAL LIPASE, CRUDE
BANANA ESTERASE AND CRUDE
TOMATO CELLULASE AND THEIR
APPLICATION IN THE DEINKING
OF LASER JET PRINTED PAPER
WASTE**

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science (Chemical Engineering)

Faculty of Chemical Engineering

March 2018

ABSTRACT

The paper industry is one of the most developed, yet the most polluted industry. Waste paper recycling has increased dramatically in recent times, and will continue to do so in the foreseeable future. The key of recycling process is the successful of the ink removal via deinking process. Considering the concern to the environmental problem cause by the conventional deinking process, enzymes are applied. Three different enzymes are applied in the deinking process of recycling routes. Research conducted utilizes commercial lipase, esterase extracted from Cavendish banana (from *Musa* gene) and cellulase extracted from *Solanum lycopersicum* (tomato) to deink laser jet printed paper. These enzymes were characterized using different physical parameters; temperature, pH value, concentration and shaking rate via enzymes assay to develop new appropriate environment for maximum ink removal which facilitated by enzymes hydrolysis and floatation process. Result showed all of the enzymes have great potential with crude cellulase was superior compared to the commercial lipase and crude esterase. The highest enzymatic activity of cellulase was 6.714U/mL, compared to 2.553U/mL for lipase and 1.819U/mL for esterase, with brighter and cleaner paper produced. The successful of the enzymes application showed on morphological changes by Scanning Electron Microscopy (SEM) which was very satisfying and brightness analysis increased up to 72% for cellulase, 48% for lipase and 39% for esterase. In conclusion, crude extracted cellulase had the highest potential to be apply in biodeinking process compared to crude extracted lipase and commercial lipase.

ACKNOWLEDGEMENT

First and foremost, all praises and thanks to God for giving me the opportunity to embark my master project and the strength also wisdom in completing this sweet, long and challenging journey successfully. I am grateful for all of the supports and contributions. I would never have completed this thesis without the assistance of numerous people who I am indebted to.

I would like to express my up most appreciation to my supervisor, Dr Nik Raikhan Nik Him for her guidance, encouragement and supervision. It such a blessing for me having a chance to be attached under her supervision in which her passion and adore towards research had really encouraged and inspired me. She is my primary resource for getting my questions answered and was instrumental in helping me cranked out this thesis with my tasks when it seemed arduous and insurmountable. My gratitude and thanks also go to my co-supervisor, Prof Ku Halim Ku Hamid and Dr Lee Chee Keong. Thank you for the support, patience and ideas in assisting me with this project.

My deepest gratitude also goes to the head of postgraduate program, Dr Siti Shawalliah Idris for a great commitment and cooperation during my Master Project. Her patient guidance, encouragement and advice were much appreciated. I am lucky to have the head of program who cared so much about my work, and who responded to my questions and queries so promptly.

I would like to take this opportunity to bid my heartfelt gratitude to the lab staff of Faculty of Chemical Engineering (UiTM) Shah Alam especially Encik Hirwan from Bioprocess Lab, for providing the facilities, knowledge and assistance during my lab work. Not to forget, Encik Hizwan from UiTM Sungai Buloh who provided the facilities and assistance during the imaging technique of the sampling.

Also countless thanks to my family who have been very supportive for each step of the way throughout, especially my beloved parents. This piece of victory is dedicated to all of you. This thesis is also dedicated to the loving memory of my very dear late brother, Mohammad Syazwan, who visualizes me about the meaning of perseverance and reliance on the power of God. You will always be in my heart and my mind.

A good support system is important to surviving and staying sane in grad school. I was lucky to have my partner of life, Mr Ray. Countless thanks to you my dear for unconditional love, patience, and continual support of my academic endeavors over the past several years enabled me to complete this thesis.

Last but not least, sincere appreciation to all my friends that has helped me directly or indirectly. There are many more people I could thank, but time, space, and modesty compel me to stop here.

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